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Consumers' preferences for carbon labels and the underlying reasoning. A mixed methods approach in 6 European countries

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ABSTRACT

The present research explores whether carbon labels are an appropriate and effective tool for increasing climate-friendly food consumption in Europe. Using a mixed methods approach which combines choice experiments and a questionnaire with qualitative face-to-face interviews, the preferences and willingness to pay for carbon labels and claimed climate-friendliness are explored in six European countries. Our results show that the presence of a carbon label increases the purchase probability and that consumers are willing to pay a price premium of up to 20% for a carbon label in all countries included in the investigation. Regarding the design of a carbon label, a combination of a horizontal scale in traffic light like colors with an absolute number of CO_2-equivalents is preferred. But consumers are willing to pay higher price premiums for local products than for carbon labeled products in most study countries. They tend to subsume climate-friendliness together with local and/or organic production under the umbrella terms 'eco-friendly' and 'ethical behavior'. Since they lack knowledge and problem awareness with respect to climate-friendly consumption, consumers are frequently overstrained with respect to climate-friendly buying decisions. Consumers expect policy makers and retailers to set up appropriate structures to support climate-friendly consumption. Given this, the contribution of a carbon label to a more climate-friendly consumption might be limited without the structural support of policy makers and retailers.
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1. Introduction

At the United Nations Climate Change Conference in Paris in December 2015, a global agreement on the reduction of climate change was negotiated - the so called Paris Agreement. In the agreement, the signing parties committed themselves to limiting global warming to less than 2 °C compared to pre-industrial levels (UNFCCC, 2016). In order to meet this target, the agreement calls for collective efforts to combat climate change. This includes a widespread public engagement, embracing the industry as well as individual citizens.

One way of combatting climate change as an individual citizen is to engage in a climate-friendly lifestyle (O'Neill and Nicholson-Cole, 2009). In this respect, food consumption constitutes an important field of action since it contributes significantly to the total greenhouse gas emissions (Vanclay et al., 2011; Vanhonacker et al., 2013).

One option to enable consumers to act in a climate-friendly manner is the implementation of carbon labeling schemes (Onozaka et al., 2015). Various retailers through Europe display carbon labels on foods, and recent research shows that consumers are generally in favor of a carbon label (e.g., Gadema and Oglethorpe, 2011; Hartikainen et al., 2014).

But so far, carbon labels have only minor relevance on the markets in most European countries, and research findings differ with respect to consumers' willingness to pay (WTP) for carbon labels (Onozaka et al., 2015). Although some studies (Grunert et al., 2014; Hartikainen et al., 2014; Lüth et al., 2009) found that people frequently refuse to pay a price premium for climate-friendly products, others come to the opposite conclusion (e.g., Caputo et al., 2013; De Marchi et al., 2016; Hartikainen et al., 2014; Onozaka and Mc Fadden, 2011; Van Loo et al., 2014). Van Loo et al. (2014), for example, found that Belgian consumers were willing to pay a price premium of up to 24% for carbon-labeled chicken breast. Research has also shown that climate-friendliness

Abbreviations: CE, Choice experiments; CO2_A, Experimental carbon label using a horizontal scale; CO2_B, Experimental carbon label adapted from the EU energy label; DE, Germany; ES, Spain; FR, France; IT, Italy; MSC, Marine stewardship council; NGOs, Non-governmental organizations; NO, Norway; UK, United Kingdom; WTP, Willingness to pay.

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is of less importance to European consumers than other sustainability attributes (Eurobarometer, 2009; Hartikainen et al., 2014; Guenther et al., 2012; Gadema and Oglethorpe, 2011). Consumers are frequently willing to pay higher price premiums for local and organic production and animal welfare indications than for carbon labels (De Marchi et al., 2016; Onozaka and Mc Fadden, 2011; Van Loo et al., 2014).

The information provided by carbon labels is often not easily comprehensible for consumers. For instance, in a UK study 89% of the respondents were confused by carbon labeling (Gadema and Oglethorpe, 2011). The underlying concept and its implications are complicated and sometimes scientifically controversial, as is the calculation of the carbon footprint itself (Baldo et al., 2009; Boardman, 2008; Burger et al., 2010; Onozaka et al., 2015). In this context, an important reason for the lack of success of carbon labels is the consumers' limited knowledge about the carbon footprint and about climate-friendly food (Hartikainen et al., 2014; Upham et al., 2011). Consumers lack an understanding of the possibility of making environmentally and climate-friendly choices by changing their food consumption habits. Therefore, they have only a limited ability to act in accordance with their interest in climate-friendly behavior (Beattie and Sale, 2009; Gadema and Oglethorpe, 2011; Hartikainen et al., 2014).

Against this background, there appears to be a need to design carbon labels which are easily understood by consumers (Upham and Bleda, 2009). Studies have shown that consumers prefer simple and concise carbon labels (Berry et al., 2008; Upham and Bleda, 2009). Consumers favor a scale which depicts the carbon footprint (Hartikainen et al., 2014; Berry et al., 2008; White et al., 2009). Scales allow customers to make a valuation based on the relative classification, which makes the labels more meaningful to consumers (Berry et al., 2008; Boardman, 2008; Upham et al., 2011). The colors of the scale should correspond to traffic lights because these are generally familiar and thus easily handled (Berry et al., 2008; Gössling and Buckley, 2016; Röös and Tjärnemo, 2011). Some consumers appreciate an absolute number for the CO_2-equivalent per unit. In this context, the combination of a scale and a number appears to be the most promising approach since it allows for direct comparison of product categories and with other actions (Berry et al., 2008; Hartikainen et al., 2014; Leire and Thidell, 2005). Additionally, regarding the low prevalence of carbon labels on the European market, whether carbon labels are an appropriate and effective tool for increasing climate-friendly consumption in Europe has to be discussed.

Accordingly, the present research investigates whether carbon labels are feasible despite the above-mentioned barriers. It compares the preferences for carbon labels in six European countries. We explore which label design would be the most appropriate one for the European market and compare the preferences for carbon labels with preferences for the indications of organic and local production. Additionally, we attempt to better understand the reasons why stated preferences do not appear in real market behavior. We follow these objectives by using a mixed method approach, combining a quantitative survey consisting of choice experiments (CE) and a questionnaire with qualitative face-to-face interviews. The strength of this approach is that we are able to reveal stated preferences and values associated with carbon labels as well as the reasoning underlying the revealed attitudes. In this manner, the approach allows to obtain a more realistic answer to the question of whether carbon labels are an appropriate communication tool to foster climate-friendly behavior.

The present paper is structured as follows: First, the methodological approach is depicted. In the next step, the results of the survey including the estimates obtained from the choice experiments are displayed, followed by the results from the interviews. Then the results are discussed in the light of recent research and finally recommendations for the support of climate-friendly food consumption are presented in the conclusions.

2. Method

Since European consumers' interest in carbon labels is a quiet controversial topic, we decided to address it in an all-embracing manner and therefore chose a mixed methods approach. In mixed methods research, quantitative and qualitative viewpoints are combined to obtain a more elaborated understanding of the issue at hand (Johnson et al., 2007). The use of mixed method research allows the consideration of different perspectives and considers convergent and/or complementary effects of different approaches. Hence, the use of mixed method research enhances the validity of the results (Denscombe, 2008).

In the present study, two different research steps were combined in order to gain a more complete understanding of European consumers' preferences with respect to carbon labels. First, a quantitative online survey consisting of choice experiments and a questionnaire was conducted with 6007 consumers in six European countries (France, Germany, Italy, Norway, Spain- and United Kingdom) to investigate consumers' preferences for two different carbon labels in comparison to local and organic production and a claim of climate-friendliness. Based on the outcomes of the survey, an interview guideline was developed and qualitative face-to-face interviews with 32 consumers were conducted in France, Germany and the United Kingdom. The interviews attempted to obtain insights into the underlying reasoning for the preferences revealed in the survey and thus attempted to close the attitude-behavior gap further.

2.1. Online survey design

The online survey was conducted in June 2015. Participants were recruited by means of a representative online access panel run by a commercial market research agency. Country-specific quotas for the three age groups ('18–29′, '30–49′, '50–70′) were set according to their shares in the total population. As far as possible, the same number of men and women participated. People working in marketing/market research and/or in the food retailing industry were excluded in order to avoid distorted results due to expert knowledge. Participants had to be at least partially responsible for the food purchasing in their household.

Table 1 shows the socio-demographic characteristics of the sample. The participants in the UK were slightly younger than in the other countries, whereas the German sample showed the highest fraction of the oldest age group. In comparison to census data in the six countries, people with higher education (12 or 13 years of school attendance, college or university degree) were overrepresented in our data. This must be taken into account when evaluating the results.

The choice experiments and the questionnaire were developed in German and English and then translated into the other languages by means of the back-translation method. The questionnaires were pre-tested in the respective national languages and checked by native speakers.

2.1.1. Choice experiments

In the present study, choice experiments (CE) were used to assess consumers' preferences and willingness to pay (WTP) for different ways of communicating the climate-friendliness of food in comparison with other sustainability indications. CE are a stated

Table 1
Socio-demographic characteristics of the survey sample (per country).

	DE	ES	FR	IT	NO	UK
Gender						
Female	49.7%	50.1%	50.8%	50.6%	51.4%	50.1%
Male	50.3%	49.9%	49.2%	49.4%	48.6%	49.9%
Age						
18–29	23.1%	20.9%	25.0%	21.0%	22.9%	26.9%
30–49	40.6%	43.7%	39.5%	44.1%	41.0%	39.3%
50–70	36.4%	35.4%	35.5%	34.9%	36.2%	33.8%
Education						
No formal qualification	0.2%	0.8%	2.6%	0.5%	0.5%	4.2%
Approximately 10 years of school attendance	48.9%	14.7%	15.6%	15.1%	5.7%	24.1%
12 or 13 years of school attendance	27.3%	40.3%	34.9%	50.1%	35.8%	19.5%
College or university degree	23.7%	44.2%	46.9%	34.3%	58.0%	52.2%
N	1001	1002	1000	1003	1001	1000

preference method commonly used to simultaneously assess consumers' preferences and their WTP (Hensher et al., 2015; Mauracher et al., 2013; Wägeli et al., 2016). Milk was selected as test product since it is a widely available product, and many consumers regularly buy it. In order to test designs for a carbon label, we created two experimental labels which we called CO2_A and CO2_B. The CO2_A label was inspired by the carbon index of the French retailer Casino ('l'indice carbone'). The other label (CO2_B) was adapted from the EU energy label. The design of both labels was based on findings from previous studies (e.g., Berry et al., 2008; Gadema and Oglethorpe, 2011; Hartikainen et al., 2014). The carbon footprint level for the two labels was based on CO_2-equivalents of milk found by Fritsche et al. (2007).

The alternatives in the CE varied by five attributes: Claimed organic production with EU organic label, claimed local production, claimed climate-friendliness, carbon label and price (Table 2).

We tested three different price levels. In all study countries, the relative price levels were the same: 0.6, 1.0 and 1.4. The absolute prices used in the experiments were inferred from the average market price for 1 l of UHT milk in the study countries one month before the experiments were conducted. The average market price equals price level 1.0 (Table 3).

SPSS software was used to create an orthogonal fractional factorial design for the CE. The design resulted in 64 choice sets. We divided the sample into eight blocks. Eight choice sets within each block were shown to each participant in random order. Before the choice tasks, a short instruction was given to the participants: “Please imagine that you wish to purchase UHT-milk. In what follows, we will present you with 8 choice situations. Each choice situation corresponds to an individual shopping transaction. In each, please choose one milk product out of the three on offer by clicking on buy”. In each choice set, participants had to choose between three alternatives. We decided to use forced choice sets because milk is an everyday product. Given this, we assumed that consumers who intend to buy milk will not cancel the purchase because of the specific combination of attributes presented to them in a choice set.

The CE were analyzed with mixed logit models using NLogit 5.0. All product attributes were modelled as random parameters and were assumed to be normally distributed with the exception of 'price'. A lognormal distribution was imposed on the price variable because this distribution results in more reasonable price estimates than a fixed price coefficient or a normal distribution (Hensher and Greene, 2002; Meas et al., 2015; Revelt and Train, 1998; Train and Weeks, 2005). Halton draws with 100–1000 replications were used for the estimations. We considered repeated choice situations and allowed for correlation between the error components of different choice situations from a given individual. The WTP was calculated in WTP space since it was found that this modelling approach results in more reasonable estimates of WTP than when the WTP is computed using ratios of parameters (e.g., Hensher et al., 2015). Coefficients within each country model were compared with the Friedman test. Differences between country models were compared by using the Kruskal-Wallis-test.

2.1.2. Questionnaire

To collect additional information on consumers' attitudes and behavior, the CE were accompanied by a questionnaire. The questions focused on the attitudes towards the two tested carbon labels and on climate-friendly behavior. A list of activities to combat climate change was shown to the participants, and they were asked to indicate which of those measures they would be willing to take. Attitudes towards the carbon labels were assessed by the degree of comprehensibility and the indicated trust in the shown labels. The comprehensibility of the two labels was explored by showing the labels to the participants and asking them to indicate on the basis of the following five statements which information they could derive from these labels:

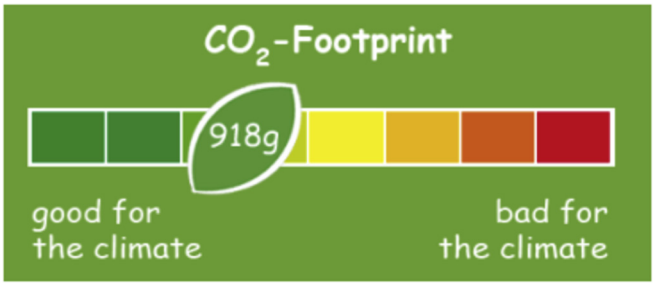
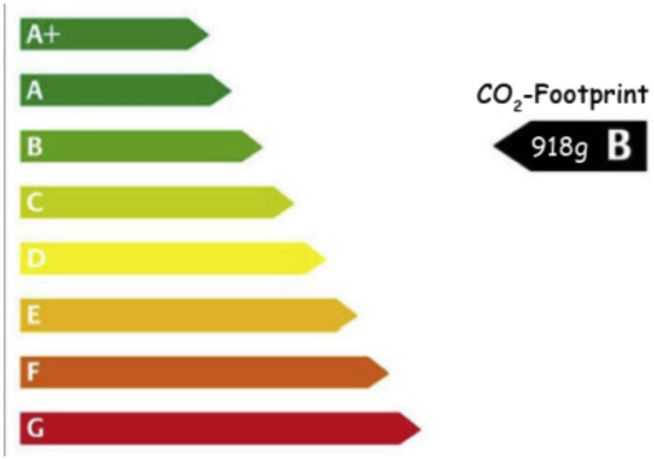
- The effect of a product on the climate
- The power consumption of a product
- The healthiness of a product
- None of the above
- I don't know.

Additionally, we assessed participants' perception of responsibility to act against climate change. On a five-point Likert scale ranging from 'no responsibility' to 'very high responsibility', participants indicated which level of responsibility they ascribed to the government, the industry, non-governmental organizations (NGOs), to citizens in general, and to themselves. Differences between variables were calculated with the Wilcoxon signed-rank test.

2.2. Face-to-face interviews

In order to explore why the stated preferences identified in the survey are frequently not reflected in actual purchase behavior of climate-friendly food, we conducted face-to-face interviews. These interviews followed a semi-structured guideline and were conducted in three of the six countries participating in the survey, following a case study approach. France, Germany and UK were

Table 2
Attributes and their levels in the choice experiments.

Product attributes	Attribute levels
Carbon label	CO2_A 
	CO2_B 
	No carbon label
Claim 'climate-friendly'	Yes/No
Claim 'local product'	Yes/No
Claim 'organic' with EU organic label	Yes/No
Price (in relative price levels)	0.6/1.0/1.4

selected. The choice of countries ensured obtaining insights from countries with and without preexisting food carbon labels. Another important criterion of selection was that all interviews were to be conducted by the same interviewer so that cross-case comparability was maximized. In total, 32 interviews took place, 11 in Germany (Brunswick) and UK (Edinburgh), respectively, and 10 in France (Paris). Each interview lasted for half an hour to an hour and was audio recorded.

Participants in Paris were randomly recruited from the street by students trained for the recruitment. In Brunswick and Edinburgh, participants were recruited by the researchers themselves by means of a snowball scheme. Participants had to be at least partially responsible for doing the grocery shopping in their household.

In total, 23 women and 9 men, 50% of whom had a university degree, participated in the interviews. Persons between the age of 18 and 30 and between 41 and 50 were the most prevalent in the sample. A summary of the sample characteristics is shown in Table 4.

Table 3
Prices in the CE in all study countries.[a]

Price levels	DE	ES	FR	IT	NO	UK
0.6	€0.50	€0.59	€0.66	€0.73	NOK10.80 (€1.12)	£0.43 (€0.59)
1.0	€0.85	€0.99	€1.10	€1.21	NOK18.00 (€1.87)	£0.71 (€0.97)
1.4	€1.19	€1.39	€1.54	€1.69	NOK25.00 (€2.60)	£1.00 (€1.36)

[a] Prices in Euro for Norway and UK are based on the exchange rates by the European Central Bank on the 6th of January 2016.

At the beginning of the qualitative interviews, consumers were tested for their knowledge of the impact of food production and consumption on climate change. Consumers were asked whom they consider to be responsible for taking actions against climate change and why. Following this, participants were asked to give their perception of climate-friendly food in particular with respect to organic and local production. Participants spoke about their interest in carbon labels. Afterwards, participants talked about barriers as well as incentives for climate-friendly food purchase behavior. In a next step, we explored participants' information needs with respect to the purchase of climate-friendly food.

The interviews were transcribed by native speakers. For the analysis of the transcripts, we used content analysis according to Mayring (2010) and the MAXQDA version 11. The basic unit of analysis was a word. The category system was developed beforehand in line with the findings of the survey. The system was pretested with 6 interviews - two for each country - and adjusted where necessary. Each text segment could be assigned to more than one category.

3. Results

This section first depicts the results of the CE, presenting consumer preferences and WTP for the different attributes. In the next

step, consumers' willingness to take actions against climate change and their trust in the experimental carbon labels is discussed. Subsequently, the results of the face-to-face interviews with respect to knowledge and perception of climate-friendly food and carbon labels are presented.

3.1. Choice experiments: consumer preferences and willingness to pay

Consumers' stated preferences and their WTP for the experimental carbon labels compared to a claim stating climate-friendliness and to organic as well as local production were analyzed with CE (Table 5). All significant mean coefficients of the tested product attributes except 'price' had a positive sign indicating a positive impact on the purchase probability of milk. In line with economic theory, consumers were less willing to buy the product when the price increased (negative sign of 'price').

Local production was preferred over all other tested attributes in the study countries with the exception of Spain, where the climate-friendly claim was the most preferred attribute (Friedman test $p < .001$). The positive coefficients for the two carbon labels suggest that climate-friendly labeled milk is more likely to be chosen than milk not declared to be climate-friendly in the investigated countries. In all study countries, the mean coefficients for CO2_A were significantly higher than those for CO2_B (Friedman test $p < .001$) indicating that consumers preferred the CO2_A label to the CO2_B label. Except in the UK the climate-friendly claim was preferred over CO2_B in all study countries. Purchase probability also increased for organic milk. In France, Italy and Spain, preferences for the CO2_A label and organic production were similar. Interestingly, in Germany, Norway and UK the CO2_A label was preferred over organic production (Friedman test $p < .001$).

The presented preferences were reflected in consumers' WTP to a certain extent. When comparing all tested product attributes, with the exception of Spain, consumers were willing to pay the highest price premium for local products (Table 6). The price premiums for local production varied between 14% in Norway to 24% in Germany compared to the average market price. In Spain, WTP for local and organic production as well as for the indication of a claim signaling climate-friendliness did not differ significantly. Thus, Spanish participants were prepared to pay similar prices for these three attributes and comparatively less for the two carbon labels (Friedman test $p < .001$).

Consumers were willing to pay a price premium for climate-friendly labeled food in all study countries. Of all three explicit indications of climate-friendliness, consumers were willing to pay the highest price premium for the CO2_A label, followed by the claim and the CO2_B label (Friedman test $p < .001$). Price premiums for the CO2_A label compared to the average market price for milk ranged between 7% (€0.14) in Norway and 20% (€0.24) in Italy. The claim indicating climate-friendliness reached higher price premiums compared to the CO2_B label (Friedman test $p < .001$) in all countries except for the UK.

In France, Italy, Norway and the UK, participants revealed a similar WTP for the CO2_A label and for organic production. Price premiums for the CO2_A label and organic production in the four countries ranged between 7% in Norway and 20% in Italy. The German participants were willing to pay a price premium of 15% (€0.13) for the CO2_A label and a premium of 12% (€0.10) for organic production compared to the average market price. It is noteworthy that the stated WTP for organic milk was lower than the average price premium for 1 l of organic UHT-milk at that time in all study countries with the exception of Italy. For example, in Germany the stated WTP for organic milk was 8% lower than the average retail premium.

When evaluating the results, one has to consider that the sample is biased towards higher education. People with higher education tend to have a better understanding of sustainability labels and are frequently more willing to buy carbon-labeled products (Chuanmin et al., 2014; Grunert et al., 2014).

Table 4
Sociodemographic characteristics of the interview sample (per country).

	DE	FR	UK
Female	7	7	9
Male	4	3	2
18–30	4	5	1
31–40	1	2	1
41–50	3	2	6
>50	3	1	3
Approx. 10 years of school attendance	2	0	0
12/13 years of school attendance	4	3	0
College or university degree	5	7	11
N	11	10	11

Table 6
Estimates of consumers' willingness to pay in Euro per 1 l UHT-Milk.

	FR	DE	IT	NO	ES	UK
Random parameters						
CO2_A label	0.11*	0.13*	0.24*	0.14*	0.14*	0.10*
CO2_B label	0.03*	0.03*	0.09*	0.00	0.11*	0.06*
Climate-friendly claim	0.06*	0.05*	0.14*	0.09*	0.15*	0.04*
Organic indication	0.12*	0.10*	0.23*	0.14*	0.16*	0.09*
Local claim	0.19*	0.20*	0.27*	0.27*	0.15*	0.15*

Note: Significance on a 99% level*.

Table 5
Estimates for consumers' marginal utilities in the 6 European study countries.

	FR	DE	IT	NO	ES	UK
Random parameters						
CO2_A label	0.409*	0.628*	0.689*	0.588*	0.491*	0.372*
CO2_B label	−0.014	0.096	0.206*	−0.019	0.368*	0.145*
Climate-friendly claim	0.291*	0.340*	0.503*	0.437*	0.703*	0.118*
Organic indication	0.360*	0.479*	0.654*	0.413*	0.524*	0.155*
Local claim	0.656*	0.936*	0.773*	0.840*	0.461*	0.706*
Price	−1.906*	−1.806*	−0.766*	−1.460*	−1.939*	−1.597*
Model specifications						
N	7680	7808	7616	7680	7808	7744
Log likelihood	−5337.813	−5488.771	−5767.541	−4613.074	−5793.489	−5909.165
McFadden Pseudo R^2	0.367	0.360	0.311	0.453	0.325	0.305

Note: Significance on a 99% level*.

3.2. Questionnaire: Activities to combat climate change, trust in experimental carbon labels

Following the CE, participants were asked a series of questions related to their willingness to combat climate change and their perception of the two experimental carbon labels. Participants were willing to combat climate change predominantly by purchasing seasonal vegetables and fruits, followed by buying climate-friendly products in general (Fig. 1). They were the least willing to consume fewer dairy products or pay a price premium of up to 20% for climate-friendly food.

3.2.1. Question: Which of the following steps would you personally take in order to combat climate change?

Of the two tested carbon labels, the CO2_A was the more trusted and the more comprehensible one. As could be expected, the CO2_B label was more often wrongly interpreted as indicating the power consumption of a product because it was mistaken for the European energy label. Nearly half of the participants perceived governments and industry as highly responsible for combatting climate change, whereas citizens and the individual participant were presumed to have a medium responsibility. NGOs were perceived as the least responsible group.

3.3. Face–to-face interviews: knowledge and information

The results of the questionnaire and the CE point out that European consumers valued food that is labeled as climate-friendly. But, market experience shows that these preferences are frequently not translated into actual purchasing behavior. The face-to-face interviews explored the reasons for this. Additionally, the interviews attempted to obtain a deeper understanding of consumers' knowledge of climate change and climate-friendly food as well as information needs in order to develop recommendations for the support of climate-friendly food consumption.

3.3.1. Knowledge about the climatic impact of food production and consumption

Our interview results show that participants had a general idea of how food production and consumption have an impact on climate change, but struggled to connect climate change with their everyday life. When they were asked how food production and consumption affect climate change, participants frequently stated that the emissions resulting from global food trade and from the production process itself exacerbated climate change. Deforestation caused by agriculture was another aspect mentioned. A few participants pointed out that livestock farming had an impact on climate change because of the climate-damaging gases emitted by, for example, cows. Accordingly, the reduction of meat consumption would be beneficial for the climate. Other food specific measures mentioned were the avoidance of food waste and, in this context, the reduction of overproduction.

> "Just buying the amount of food you need. […] For example I just buy a half loaf of bread and that is enough for me for a week." (DE, Participant 1, female).

Participants had difficulties separating climate change from other environmental and ethical topics. They tended to subsume climate change and related issues under the umbrella of environmental and ethical issues. When asked which measures could be undertaken to combat climate change, some participants spoke not only about directly climate related topics, but also about measures they undertook for the environment, to foster animal welfare and about fair trade. One common topic in this respect was the engagement in activities for an efficient use of resources (e.g., wearing second hand clothes). Especially in France and the UK recycling emerged as a solution for climate change, whereas it was not mentioned in Germany.

> "I think, I feel I can sort of grapple with sustainable food systems and I see that part of that wider debate about climate change and in terms of what decision I'm making when I'm choosing food and things I can work at that sustainable food system level, and I'll let others think about the connections between that and climate change." (UK, Participant 3, male).

In line with the low to vague knowledge about the impact of

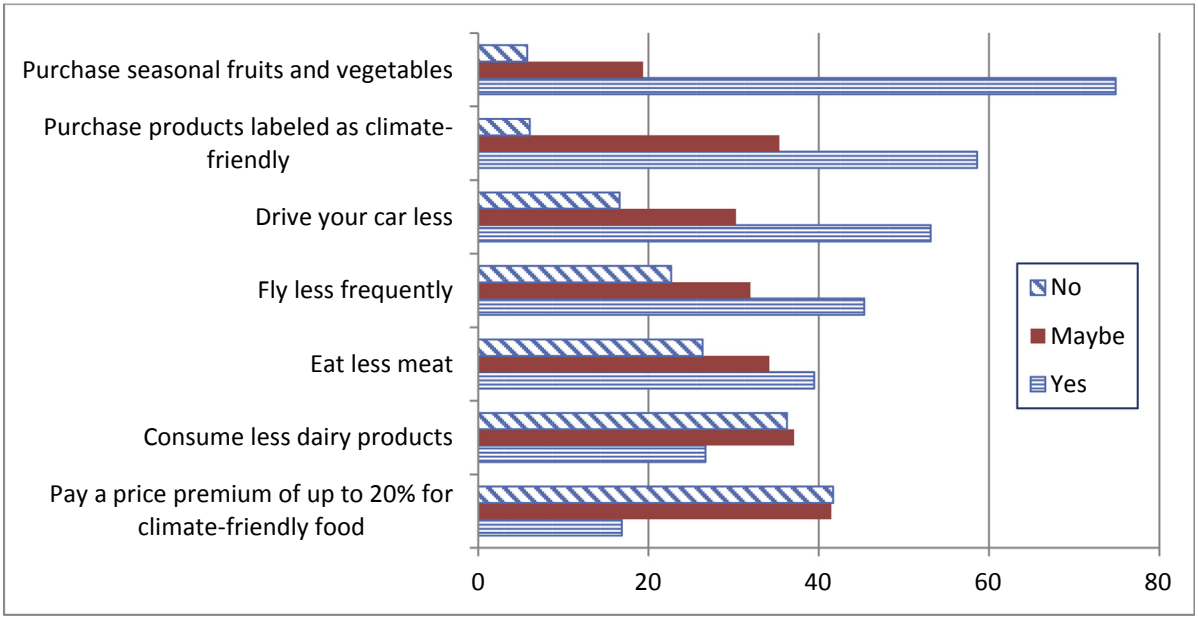


Fig. 1. Participants' willingness to undertake suggested activities in order to combat climate change (%).

food production and consumption on climate change, people often lacked a concrete idea of what climate-friendly food means. Frequently, participants started to develop ideas about the term when asked if they bought climate-friendly food.

> "I prefer it generally, climate-friendly. I guess if it's local and organic then it's going to be more climate-friendly than some that's not local and organic. Climate-friendly organic. If you're helping the environment which I guess is climate related so yes." (UK, Participant 2, female).

Climate-friendly food was associated with local production and sometimes also with seasonal production. Local production was mostly associated with a more climate-friendly production due to shorter transport distances. However, some participants argued that local products are not particularly climate-friendly as long as they are produced conventionally. Some participants related organic to climate-friendly food. It was reasoned that the ban of artificial pesticides and fertilizers made organic products more climate-friendly. Others stated that they had no clear idea of whether organic goods are more climate-friendly than conventional products. Part of the participants doubted the climate-friendliness of organic food due to potentially long transport distances and large-scale production.

3.3.2. Information and labels

Labels for climate-friendly products were mostly unknown even though the UK retailer 'Tesco' had a carbon label until 2012, and the French retailer 'Casino' still has a carbon footprint label on their own products. In all three countries, many participants said that information about climate-friendly food was scarce or not to be found at all and that they needed more information in order to consider buying climate-friendly food. Accordingly, climate-friendliness was often not the main reason for preferring certain products over others but rather a positive side-effect.

Some participants were skeptical about the sustainability information offered because they perceived it as greenwashing. Others felt overwhelmed by the product information already offered and were not inclined to consider, for example, another label in their purchase decision. Others were generally in favor of more information. Thus, the interviewees were indecisive as to whether too much or too little information about climate-friendly behavior and climate-friendly food consumption in particular was available.

> "Well, if I would start to look for information about climate-friendly food I would certainly find enough. But having a label would still be beneficial. But then eventually there will be too many labels to consider climate-friendliness in the purchase decision" (DE, Participant 1, male).

Given these contradictory views, participants tended to prefer to have more information about climate-friendly food - but only to have the information at hand when they needed it, but not in order to consider this information in their everyday choices. The information was perceived as an assurance for an ethically acceptable production on which consumers wanted to rely instead of scrutinizing the actual ethical justifiability of a product on an everyday basis. According to the interviewees, the information should be practical and enabling, such as advice about how to integrate climate-friendly behavior in everyday life. Additionally, the information should be concise, comprehensible, reliable and readily available. In this context, a carbon label was welcomed but not perceived as absolutely needed, and some participants even doubted that they would use such a label.

3.3.3. Perceived responsibility to combat climate change

The analysis of the interviews confirmed that participants perceived the government as one of the primary responsible agents for acting against climate change. Reasons stated were the organizational as well as financial capacities of the government. Participants argued that the government would be able to initiate collective actions, which would be more effective than individually undertaken measures. Furthermore, participants said that the government as the representative of the people has an obligation to act.

> "The governments. I think the government should be putting down policies that we can then follow to help us help them." (UK, Participant 3, female).

In line with the results of the questionnaire, the industry and particularly retailers were mentioned as other responsible parties for tackling climate change. Some participants said that the industry had to do their share and even take a pioneering role. Sometimes it was suggested that retailers should use their influence on the market to provide affordable climate-friendly food. But in general, participants tended to focus more on the responsibility of the society as a whole. A typical statement was:

> "Everyone is responsible, everyone without exception" (DE, Participant 10, male).

4. Discussion

The results of the survey and the interviews confirm European consumers' general interest in climate-friendly behavior. In both research steps participants welcomed carbon labels on foods. In the CE, consumers were willing to pay a price premium of up to 20% for products showing an explicit indication of climate-friendliness. Of the two tested carbon labels, the one showing a horizontal scale (CO2_A) was clearly preferred over the one inspired by the EU energy label (CO2_B). The CO2_A label was more comprehensible and more frequently trusted. Consumers in all study countries were willing to pay higher price premiums for the CO2_A label than for the CO2_B label and the claim.

However, our study stresses that climate change is less important to consumers than other environmental, personal, and social issues (see also Hartikainen et al., 2014; Lorenzoni and Pidgeon, 2006). In most of the study countries, consumers considered local production as particularly important, and they were willing to pay higher price premiums for such products than for climate indications and organic production. These findings underline the growing popularity of locally sourced food (Darby et al., 2008; Feldmann and Hamm, 2015; Meas et al., 2015; Zepeda and Li, 2006). In four of the six study countries, the WTP for the CO2_A label and organic production was similar. This highlights, on the one hand, that organic might have become more commonplace and lost some of its uniqueness to consumers (see also Janßen and Langen, 2017), whereas consumes are curious about a carbon label. On the other hand, this result suggests potential substitution effects between the shown carbon labels and the attributes 'local' and 'organic production'. Lombardi et al. (2017) found that after informing consumers about climate change issues, the utility of carbon free milk increased, whereas the utility of organic milk decreased. Onozaka and Mc Fadden (2011), and Akaichi et al. (2017) showed that carbon labelling is complementary to the indication of

local sourcing. Participants in both studies were more reluctant to purchase local products if they displayed a high carbon footprint. But Janßen and Langen (2017) point out that the relationship between these sustainability labels depends on the consumer segment and might only be relevant to a small group of consumers particularly sensitive to sustainability issues.

The interviews show that consumers had problems defining and identifying climate-friendly food. This might be another reason for some consumers to prefer local and organic production over any explicit climate indication. Consumers are more familiar to the term 'local' and to the organic logo as both are actually more present in the market. Moreover, consumers associate more ethical and personal benefits with the attributes 'organic' and 'local' than with indications of climate-friendliness (Röös and Tjärnemo, 2011; White et al., 2009). Consumers associate local production with the benefits of sustaining local farmland and contributing to the local economy as well as healthiness (Onozaka and McFadden, 2011; Darby et al., 2008; Feldmann and Hamm, 2015).

Combining the results of the preferences for carbon labels, local and organic production with the findings of the interviews shows that participants tended to subsume climate indications together with the attributes 'local' and 'organic production' under the umbrella term 'eco-friendly behavior'. Consumers paid more attention to more 'general' green and ethical goals than to climate change in particular (see also De Boer et al., 2016; Hartikainen et al., 2014). The carbon footprint is one aspect of many environmental and ethical criteria which many consumers are unlikely to differentiate in detail. Some consumers just prefer products with one or more sustainability labels without further differentiating between specific sustainability attributes (see also Janßen and Langen, 2017).

Consumers' problems in defining climate-friendly food are also an indication for their lack of knowledge about climate-friendly engagement and their difficulties in connecting the complex issue of climate change to their everyday life (see also Berry et al., 2008; Lorenzoni and Pidgeon, 2006; Upham and Bleda, 2009). Consumers felt that they were not knowledgeable enough about their options to act in a climate-friendly manner (see also Beattie and Sale, 2009; Gadema and Oglethorpe, 2011; Hartikainen et al., 2014). Some demanded more practical and concise information. In this context, they also welcomed the introduction of a carbon label. But participants also stressed the existing information overflow as well as label fatigue and skepticism. Therefore, information should be available but will not necessarily be considered in everyday choices. In our study, some of the interviewees doubted that they would pay attention to carbon labels even though they generally appreciated the presence of such information. Thus, a substantial use of carbon labels by consumers is questionable (see also Grunert et al., 2014; Hartikainen et al., 2014; Upham et al., 2011).

Nevertheless, there are also indirect effects of consumer labels, which can be quite effective: Retailers might adjust their sourcing policies by requiring carbon footprint labeling and removing products with particularly high carbon values within a product category (e.g., Berry et al., 2008; WB, 2011). One excellent example is the sustainability label of the MSC (Marine Stewardship Council) for wild fish. In Germany, the largest fraction of frozen fish is labeled with the MSC logo, and many retailers committed themselves to phase out wild fish products without a sustainability label although consumer knowledge is limited (Zander et al., 2015).

Consumers clearly expected policy makers to provide a favorable environment for climate-friendly behavior and also suggested that retailers should support consumers in making climate-friendly choices. This result shows that consumers are well aware of their limits of action in dealing with such a complex and wide-ranging issue as climate change. Climate change is perceived as a challenge which has to be addressed collectively (see also Lorenzoni et al., 2007). This is well in line with other studies which point out that the political sphere and the economic sector also have to address climate change in order to successfully reduce its negative impacts (e.g., Berry et al., 2008; Gadema and Oglethorpe, 2011; Seyfang, 2005; Voordouw and Dagevos, 2013).

5. Conclusions

Our study shows that consumers are interested in and concerned about climate change and are also willing to engage in actions against it. The results suggest that carbon labels are preferred over a claim stating climate-friendliness and that a label combining a horizontal scale with traffic light like colors and an absolute number of CO_2-equivalents might be an appropriate design. But our research also highlights the fact that the contribution of a carbon label to a more climate-friendly consumption will be limited for several reasons. For instance, in nearly all analyzed countries consumers favor local production over indications of climate-friendliness. They tend to subsume climate-friendliness together with local and organic production under the umbrella terms 'eco-friendly' and 'ethical behavior'. Additionally, due to their lack of knowledge and problem awareness, consumers might be overburdened with respect to climate-friendly buying decisions. This makes it unlikely that a noticeable fraction of consumers will actively consider carbon labels when making purchase decisions, also in trade-off with local and organic production.

5.1. Recommendations

Our results underline the limits of climate-friendly consumer behavior. Labeling can be just one part of a broader concept to promote lifestyle changes and public acceptance (Berry et al., 2008; Gadema and Oglethorpe, 2011; Prieß, 2011; Whitmarsh, 2009; Whitmarsh et al., 2011). Other options might, for example, be nudging solutions like a dedicated space for climate-friendly food in supermarkets and the positioning of climate-friendly food on eye-level. Nudges have the advantage that they help people to act in line with a desired behavior without taking away their choice options (Thaler and Sunstein, 2009).

Given that the mitigation of climate change is a societal and political aim, policy makers are challenged to set proper structures to foster climate-friendly behavior not only at the consumer but also at the industry level. Options at the consumer level are, for example, information campaigns or the inclusion of climate-friendly behavior in formal education. Measures targeting the industry would be, e.g., taxes on foods and other products with a particularly high carbon footprint. These activities should consider the broader context of environmental and general ethical issues in order to facilitate uptake and to avoid potential negative effects resulting from standalone actions.

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